

1                   **ASSEMBLY AND METHOD OF MOUNTING A LIQUID DELIVERY DEVICE**  
2                   **UTILIZING EXPANDING BUSHING**

4                   **Background of the Invention**

5     This application claims benefit of the priority date of provisional applications, S.N.  
6     60/279,470 filed March 29, 2001; S.N. 60/279,479 filed March 29, 2001; and S.N. 60/279,480  
7     filed March 29, 2001.

8                   **Field of the Invention**

9     This invention relates to a multiple valve faucet mounting system for a multiple valve  
10   faucet, soap/lotion dispenser, or water dispenser. More particularly, it relates to a method for  
11   mounting a liquid delivery device, such as a unitary flow faucet valve or spout, in a soap/lotion  
12   dispenser or water dispenser mounting hole solely from the top of the sink.

13                  **Description of the Prior Art**

14     Generally, the prior art describes mounting a faucet valve body on a sink or bathtub deck,  
15   soap/lotion dispenser, or water dispenser, by means of nuts and washers threaded around the  
16   valve body and tightened from below the sink or bathtub deck. This is time consuming and  
17   annoying since space under the sink or bath tub deck is limited and difficult to work within. A  
18   method is needed to secure a faucet valve, soap/lotion dispenser or water dispenser to the sink or  
19   bath tub deck without the need to work from below the sink or bath tub deck, but solely from the  
20   top of the sink or bath tub deck.

21     Several prior art methods employing coupling devices for mounting a structure exist.

22     U.S. PATENT 4,068,858 describes a handle bar mounting member on a bicycle. A  
23   tubular shank extends into the steering column and there is a wedge being wedged into place. A

1      wedge bolt extends from the top of the handle bar mounting member and through the tubular  
2      shank. This moves the wedge into its wedging position.

3            U.S. PATENT 5,025,826 describes a faucet handles universal coupling. There are a  
4      plurality of jaws having inner surfaces for engaging a valve stem peripheral surface and a group  
5      of outer camming surfaces. As a screw is tightened, the forces on the tapered surface press the  
6      inner surface of the inner jaws tightly against the valve stem's peripheral surfaces.

7            U.S. PATENT 5,176,464 describes a mechanical coupling apparatus which includes an  
8      elongated driven member having an axial extremity. There is a first sleeve including at least a  
9      first wedge shaped surface having generally planer faces and a thin cross-sectional axial part and  
10     thick cross-section axial part. The drive and driven members are disposed with the drive  
11     surfaces disposed in nested axially overlapping relationship with the first wedge shaped surface  
12     disposed radially intermediate the respective drive surfaces.

13            U.S. PATENT 5,190,393 describes an expandable device for attaching a shaft to a hub.  
14      The shaft has a truncated conical end. An expandable sleeve mates with the truncated conical  
15     end of the shaft. A threaded washer enables a screw to be used to tighten the parts together.

16            U.S. PATENT 5,538,536 describes a link for pivotally connecting one member to a  
17      second member. The shaft is positioned in the aligned holes. The shaft has a central axis  
18      extending between a pair of threaded ends of the shaft. An expandable internally tapered wedge  
19      sleeve is mounted on each of the tapering end portions of the shaft. A nut is threaded on each  
20      end of the shaft. The nuts move the wedge sleeve members along the inclined outer surface of  
21      the tapering end portions of the shaft. Each sleeve member has a plurality of peripheral  
22      segments.

U.S. PATENT 5,737,974 describes a fastening assembly for a handlebar upright tube. The assembly has a tightening head 3 that fits inside the arresting tube 4. By screwing down on the nut 2, the tightening head is tightened against the inner surfaces of the arresting tube 4.

4 None of the above methods or systems can be satisfactorily employed for easily  
5 mounting a faucet and the like to a sink or bathtub deck. A better method is needed.

## **Summary of the Invention**

8           The annoyance of attaching a fluid delivery device such as a multiple valve faucet,  
9  
10      soap/lotion dispenser, or water dispenser to a sink or bathtub deck by working under the sink or  
11     deck, is eliminated by the method of this invention. In the method of this invention an upper  
12     portion of a flanged bushing having a diameter greater than the mounting hole in a sink or bath  
13     tub deck, is inserted over the hole with the lower portion skirt of the flange bushing descending  
14     into the mounting hole. The flanged bushing has a conical bore with the lesser diameter located  
15     on the flanged area of the bushing. The conical surface of the bore of the flanged bushing bore is  
16     threaded. The lower portion of the flange bushing skirt encloses a conical threaded expansion  
17     sleeve or bushing. As the conical expansion sleeve is turned, utilizing vertical key slots in the  
18     bore of the expansion bushing, the expansion sleeve moves upwards into the flange bushing skirt  
19     and thereby expanding the skirt having flexible spaced fingers to force the exterior surface of the  
20     skirt against the interior surface of the mounting hole. A fluid delivery device such as a faucet  
21     valve body or spout, soap/lotion dispenser, or water dispenser is lowered through the bores of the  
22     flange bushing and expansion bushing. An escutcheon is secured to the top surface of the flange  
23     bushing by means of a threaded collar engaging the outside threaded edges of the flanged

1 bushing to be fixed by attaching the valve body, soap/lotion dispenser, or water dispenser or  
2 sprayer to the sink or bath tub deck without the need to make adjustments from below the sink or  
3 deck.

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5 **Brief Description of the Drawings**

6 Fig. 1A is a side elevational view, with parts in section, of the mounting assembly for  
7 multiple valve faucet, soap/lotion dispenser, or water dispenser in an unexpanded mounted  
8 position of the invention;

9 Fig. 1B is a side elevational view, with parts in section, of the mounting assembly of Fig.  
10 1 in a mounted expanded configuration;

11 Fig. 2 is a side perspective view, with parts exploded, of the mounting assembly of Fig. 1  
12 for mounting a valve assembly,

13 Fig. 3 is a front perspective view, with parts in section, of the mounting assembly of the  
14 invention mounting a multi-valve assembly;

15 Fig. 4 is a partial exploded side perspective view, with parts in section, of the mounting  
16 assembly of Fig. 1 showing a rotatable mounting tool;

17 Fig. 5 is a front perspective view, with parts in section, of the mounting assembly of the  
18 invention mounting a soap/lotion dispenser;

19 Fig. 6 is a front perspective view of a water sprayer utilizing the mounting assembly and  
20 method of the invention; and

21 Fig. 7 is a front perspective view of a water sprayer utilizing the mounting assembly and  
22 method of the invention shown mounted on a sink.

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2                   **Description of the Preferred Embodiments**

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4                 The invention may be best understood by those having ordinary skill in the art by  
5 reference to the following detailed description when considered in conjunction with the  
6 accompanying drawings in which:

7                 In Figs. 1A and 1B the essence of this assembly and method in a cross sectional view for  
8 mounting a fluid delivery device on a sink or tub is illustrated. A flanged bushing 4 formed of  
9 plastic or metal is positioned with the lower plane of its flange 11 lying flat on the surface of the  
10 sink 21 (Figs. 1 and 3). The flanged bushing 4 has a skirt 8 downwardly projecting from the  
11 flange 11 through the mounting hole 48 in the sink 21. The flanged bushing 4 has a through bore  
12 along the axis 37. The through bore 34 is cylindrical 34 in shape from the top surface 33 of the  
13 flanged bushing 4 downwards at an equal length to the thickness of the flange 11. From the  
14 lower edge of the cylindrical bore 34, the bore increases in diameter forming a truncated conical  
15 shape within the skirt 8 with the major diameter of the cone being located at the base of the skirt  
16 8. The skirt 8 consists of a number of flexible spaced fingers 47 formed of plastic or metal  
17 equally spaced in an annular arrangement. A circular recess having a rectangular cross-section 53  
18 is located inside the bottom surface of the flange 11 for the purpose of receiving the flange of a  
19 mounting hole adjustment sleeve 29 as shown in Fig 1B. The interior conical bore of the skirt 8  
20 is equipped with a screw threads 24 following the taper of the cone thereby establishing a tapered  
21 screw threads on the inside of the flexible fingers 47.

22                 As further seen in Figs. 1A and 1B, a locator key 9 with its longitudinal top surface  
23 smaller than its base is positioned on the horizontal centerline of the flange 11 of upper surface

1       33. An expansion sleeve 5 having a threaded exterior surface 12 having a truncated conical  
2 configuration and a cylindrical bore 13 is located within the skirt 8. The conical screw threads  
3 12 have substantially the same pitch, thread depth and taper as the threads 24 inside the skirt 8.  
4 A number of equally spaced shallow vertical key slots are positioned within the interior bore 13  
5 for the entire length of the expansion sleeve 5. An upper collar 7 is positioned above the flanged  
6 bushing 4 is an upper collar 7. The exterior of the upper collar 7 is ornamental with a design to  
7 compliment the general appearance of the faucet. The lower segment of the exterior of the  
8 escutcheon collar 7 has a conical exterior surface 49 with the major diameter substantially the  
9 same as the diameter of flange 11 and the minor diameter slightly smaller than the minor bore  
10 diameter 50 of the locking collar 2. The angle of the conical surface 49 is substantially the same  
11 as the angle of the interior conical surface 27 of the locking collar 2.

12           As further seen in Figs 1A and 1B, a key slot 10 is located along the horizontal center  
13 line of the base 35 of the escutcheon collar 7. The size and configuration of the key slot 10 is  
14 such that it accommodates locator key 9 on the flanged bushing 4. The cylindrical bore of the  
15 escutcheon collar 7 has an internal screw thread 25 to accommodate the exterior thread 23 on the  
16 faucet valve body 6. An annular lockdown collar 2 is positioned around the lower segment of  
17 the escutcheon collar 7 and the flanged bushing 4. The upper portion of the bore 27 of the  
18 lockdown collar 7 is conical in shape with the minor diameter of the conical portion of the bore  
19 located at the top of the plane of the lockdown collar and the major diameter slightly above the  
20 top of the cylindrical threaded 46 segment of the bore. The screw threads 46 inside the  
21 cylindrical segment of the lockdown collar 2 are substantially the same size and pitch as the  
22 threads 45 on the flanged bushing 4. The conical segment 27 of the lock down collar 2 engages  
23 the exterior conical surface 49 of the escutcheon collar 7. As the lock down collar 2 is rotated

1 the lock down collar threads on to the flange 10 of the flanged bushing 4 forces the escutcheon  
2 collar 7 downwards onto the surface 33 of the flanged bushing 4 to engage the locator key 9 into  
3 the locator key slot 10 and thus firmly securing the escutcheon collar 7 to the flanged bushing 4.  
4 A rectangular recess 54 is located in the base of the lockdown collar 2 between the exterior and  
5 the interior diameter of the base of the lockdown collar. An "O" ring or seal 26 located within  
6 the recess 54 seals the lockdown collar 2 to the sink 21 preventing water on the sink surface to  
7 pass through the mounting hole into the space below the sink.

8 In Fig 1B., the method of mounting with the expansion sleeve 5 threaded into the skirt 8  
9 expanding the fingers 47 and locking them against the interior surface of a mounting hole is  
10 shown.. On occasions the mounting hole in the sink might be larger than the standard 1  $\frac{1}{4}$ "  
11 diameter and in this event a mounting hole adjustment sleeve 29 is used. The flange of a  
12 mounting hole adjustment sleeve 29 is located in the recess 53 with the skirt of the sleeve  
13 projecting downwards occupying the space between the flanged bushing's skirt 8 and the interior  
14 surface of the mounting hole. This method of mounting allows the faucet valve body or spout, a  
15 soap/lotion dispenser, or a water dispenser to be mounted onto a sink or counter there by saving  
16 time and inconvenience of working in cramped quarters under the sink.

17 As seen in Fig. 4, a rotatable tool 30 comprises a shaft 32 and a tool blade 31. The  
18 rotatable tool 30 is lowered through the cylindrical bore 34 of the flanged bushing 4 into the bore  
19 13 of the expansion sleeve. The tool blade 31 has a thickness slightly less than the width of  
20 vertical key slots 14 and a width of the tool blade 31 greater than the bore diameter 13 but less  
21 than the sum of the bore diameter 13 plus two times the depth of the vertical key slot 14. When  
22 the rotating tool 30 is rotated while engaged in the expansion sleeve 5, the expansion sleeve 5  
23 moves upwards into the bushing skirt 8 and consequently expanding the skirt fingers 47

1 increasing the outside diameter of the bushing skirt 8 to a size greater than the diameter of the  
2 mounting hole for complete securement of the flanged bushing.

3 In Fig 3 a typical faucet installation utilizing the mounting method shown in perspective  
4 with sections at mounting holes is shown. A centrally located spout 1 is secured in mounting  
5 hole 41 of the sink 21 in much of the same manner as described in FIG 1 with the exception that  
6 there might not be a need for an escutcheon collar, and the lockdown collar 2 engages a conical  
7 annulet at the base of the spout 1. The lower body 16 of the spout has attached the hot water line  
8 18 and the cold water line 19. The volume of water flowing through lines 18 and 19 is controlled  
9 by the hot 51 and the cold water 52 valves with the ratio of the volume determining the  
10 temperature of the water delivered by spout 1. The hot and cold water valves are secured in  
11 mounting holes 40 and 42 respectively in the same manner as described in FIG 4.

12 Figs 2 and 4 show an exploded parts view of a faucet valve utilizing the mounting  
13 assembly and method. In Figs. 2 and 4 a faucet valve body 6 with an upper threaded segment 23  
14 and a cylindrical lower segment 6 with a diameter slightly smaller than the minor pitch diameter  
15 of threaded segment 23, has an escutcheon collar 7 threaded onto its threaded segment 23. A  
16 valve handle 3 is secured to the valve by means of a spline bore within the handle 3 which fits  
17 onto the shaft spline 15 and held down by means of a screw 39 which is threaded into the screw  
18 hole 43 inside spline shaft 15. The flanged bushing 4 is secured to the sink as shown in Fig 2,  
19 after which the faucet valve body 6 with escutcheon collar 7 attached is lowered through the  
20 bores of the flanges bushing 4 and the expansion sleeve 5. When the locating key 10 is engaged  
21 in locating key slot 9 in the escutcheon collar 5, the lockdown collar 2 is lowered over the  
22 escutcheon collar and threaded on the flange 11 of the flanged bushing 4, thereby securing the

1 escutcheon collar and valve body to the sink surface. The valve handle 5 is attached to the valve  
2 stem 15 after the valve assembly is secured to the sink

3 In Fig. 5 there is illustrated a soap/lotion dispenser assembly 55 having a bottle 56 for  
4 soap, lotion, and the like mounted on the sink 21. The soap/lotion dispenser 55 is mounted in  
5 generally identical manner by the mounting assembly and method as previously described with  
6 reference to Figs. 1A, 1B, 2 and 4.

7 In Figs. 6 and 7, there is illustrated a water sprayer or dispenser 57 have a water hose 78  
8 for dispensing water or filter and water mounted on sink 21. The soap/lotion dispenser 57 is  
9 mounted generally identical in a manner by the mounting assembly and method as previously  
10 described with reference to Figs. 1A, 1B, 2 and 4.